NAVAL BIODYNAMICS LABORATORY

1993
COMMAND HISTORY

May 1994

NAVAL BIODYNAMICS LABORATORY
P.O. Box 29407
NEW ORLEANS, LA 70189-0407

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Prepared for

Naval Medical Research and Development Command
Bethesda, MD 20889-5044

Approved and Released by:

R. W. RENDIN
Commander, Medical Service Corps
United States Navy
Commanding Officer

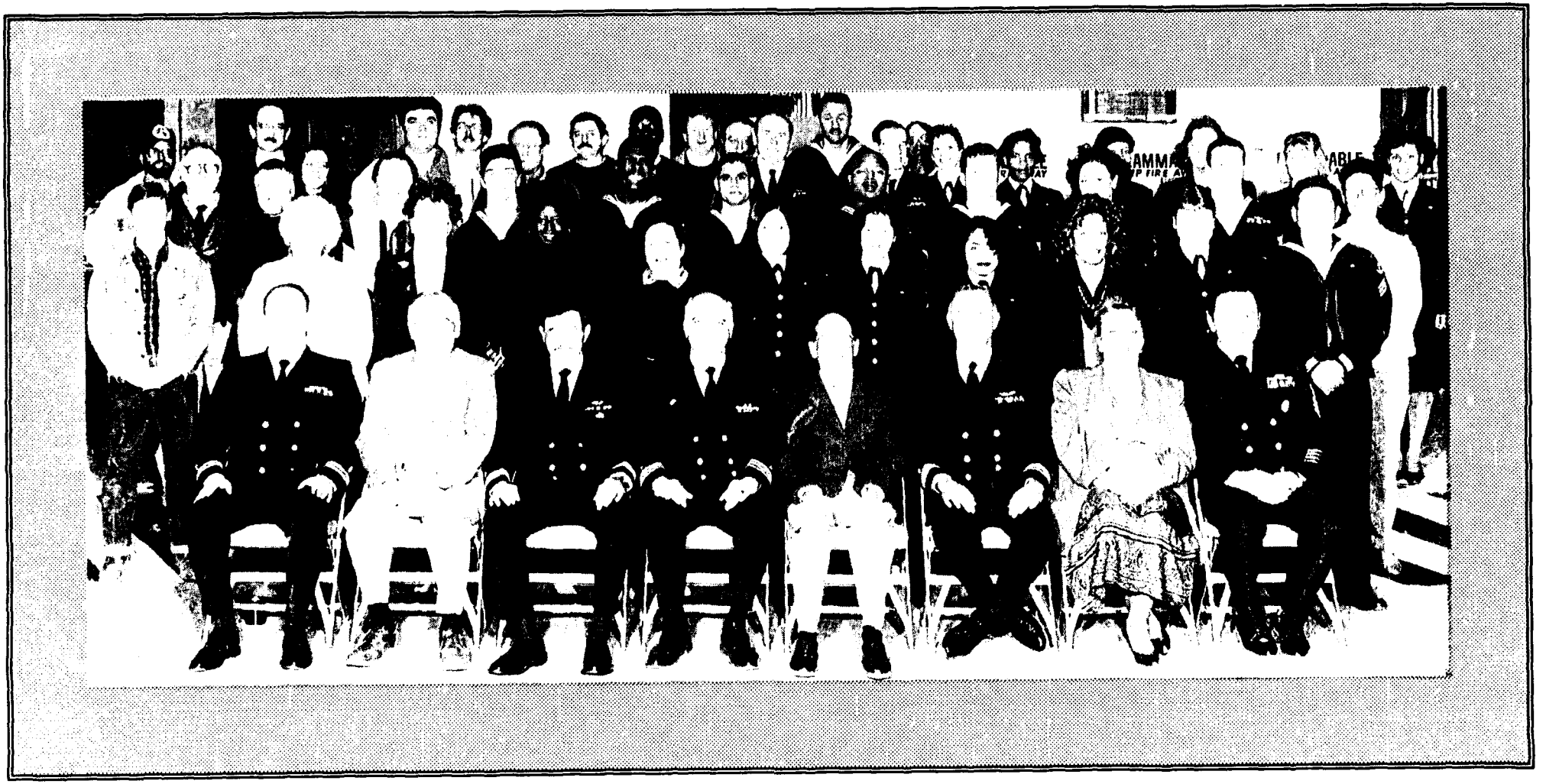


TABLE OF CONTENTS

INTRODUCTION 1-2

NBDL MISSION, VISION, AND GUIDING PRINCIPLES 3

1993 TOTAL FUNDING/PERSONNEL STRENGTH 4

ORGANIZATION CHART 5

COMMANDING OFFICER 6-7

EXECUTIVE OFFICER, DEPARTMENT HEADS, AND COMMAND CHIEF 8-9

HUMAN RESEARCH VOLUNTEERS 10

FACILITIES 11-16

RESEARCH DEPARTMENT 17

- MATHEMATICAL SCIENCES DIVISION 17-19
- HUMAN FACTORS DIVISION 20-22
- DATA SYSTEMS DIVISION 23

BIOMEDICAL SUPPORT DEPARTMENT 23

TECHNOLOGY DEPARTMENT 24

- ENGINEERING DIVISION 24
- BIOINSTRUMENTATION DIVISION 24-26

RESEARCH SUPPORT DEPARTMENT 27

- ADMINISTRATIVE DIVISION 27
- SUPPLY DIVISION 27-28

FISCAL DEPARTMENT 29

PROFESSIONAL MEETINGS ATTENDED 30-32

PRESENTATIONS 33-35

PUBLICATIONS 36-37

DISTINGUISHED VISITORS 38-41

COMMUNITY SERVICE 42-43

NBDL PERSONNEL IN ACTION 44-45

MILITARY AWARDS 46-47

CIVILIAN AWARDS 48

MILITARY AND CIVILIAN REPORTING/DEPARTING 49

IN MEMORY OF MICHAEL SUCHANEK 50

TELEPHONE DIRECTORY 51

NAVAL BIODYNAMICS LABORATORY

HISTORY

The Naval Biodynamics Laboratory (NBDL) was established as the Naval Aerospace Medical Research Laboratory Detachment (NAMRLD) in April 1971 by the Bureau of Medicine and Surgery. NAMRLD was a detachment of the Naval Aerospace Medical Research Laboratory which is located at the Naval Air Station, Pensacola, Florida. The initial purpose of the Detachment was to study human response to impact acceleration. In 1975, the mission was expanded to include human response to vibration, ship motion, and to study human performance. NBDL was designated a separate command by the Secretary of the Navy in February, 1980, and officially established by OPNAV NOTICE 5450 on 28 February 1980.

Captain Channing L. Ewing, MC, USN was the first Officer in Charge of the Laboratory. Commander Robert S. Kennedy, MSC, USN became the Officer in Charge in December of 1976, and was relieved by Captain James E. Wenger, MC, USN in August 1979. Captain Wenger became the first Commanding Officer when the Laboratory was designated a command in August 1980. Captain Loys E. Williams, MC, USN assumed command in 1982 and was relieved by Captain Robert J. Biersner, MSC, USN in August of 1984. Captain Biersner served until April 1987 and was succeeded by Commander Don M. Herron, MSC, USN. Captain Douglas W. Call, MSC, USN became Commanding Officer in May 1987 and was relieved by Commander Robert W. Rendin, MSC, USN, in May 1992.

COMMAND RELATIONSHIPS

NBDL is under the command of Naval Medical Research and Development Command (NMRDC) and receives primary support from the Chief, Bureau of Medicine and Surgery, Washington, DC.

NASA Michoud Assembly Facility

NBDL leases its facilities from the National Aeronautics and Space Administration (NASA) Michoud Assembly Facility. The NASA Michoud Assembly Facility in eastern New Orleans boasts a long and colorful history. The King of France deeded the original 35,000 acre site to Antoine Michoud, a Louisiana soldier and statesman, in 1763. The land, located some 15 miles northeast of central New Orleans served as a source of timber for building and repairing ships, and as a rich hunting ground for trappers and fur traders. In later years, the fertile, low-lying fields were used to grow sugar cane, and for almost 100 years the sprawling plantation was owned and operated by the Michoud family.

With the outbreak of World War II, large tracts of land with deep-water access were needed for defense related construction. The U. S. Maritime Commission acquired one thousand acres of the former Michoud Plantation for building Liberty Ships. In 1942, plans for the tract were changed and a contract was issued for constructing 1200 plywood cargo airplanes at the new Michoud facility. By October 1943, the main production facility, encompassing 43 acres under one roof, was completed and aircraft construction began. Two years later, with the war drawing to an end, Michoud was closed after completing two airplanes, and was placed in the inventory of the War Assets Administration. Later, the New Orleans Dock Board acquired the tract from the federal government through a lease/purchase agreement to serve as an industrial development complex. With the outbreak of fighting in Korea, the Michoud site was reclaimed by the federal government and in late 1951 was reopened under direction of the U.S. Army Ordnance Department to build 12-cylinder air-cooled engines for Sherman and Patton tanks. As the Korean conflict diminished, engine production was reduced and the Michoud facility closed again in July 1953.

In 1961, NASA acquired the Michoud facility from the Department of Defense to serve as a final assembly point for the manufacture of large space launch vehicles which could be transported by barge to the launch site at Cape Canaveral, FL. The first Apollo mission to the moon in July 1969 was powered by a Michoud built Saturn 1C booster.

In 1973, Martin Marietta Aerospace was awarded a contract to design, develop, and manufacture nine external propellant tanks for the Space Shuttle. The external tank, which provides some 1.6 million pounds of propellant for the Shuttle's three main engines, is the only Space Shuttle component that is not recovered for reuse. Recently, Martin Marietta was awarded contracts to produce fifty-nine of the 154 foot long, 28-foot diameter tanks, and thus continues to support the Space Shuttle project.

Today, the 883-acre Michoud facility contains one of the largest production buildings in the nation, a vertical assembly building for stacking external tank components, as well as pneumostatic and systems test buildings and administrative offices. Some 2,310 Martin Marietta employees work at the Michoud Assembly Facility. Employment by other federal agencies at Michoud increases total employment at the facility to nearly 4,530 people.

NBDL MISSION

OUR MISSION is to enhance the performance of and prevent injury to the men and women of the United States Navy and Marine Corps.

WE WILL ACCOMPLISH this by conducting biomedical research on the effects of mechanical forces encountered by crew members in Navy/Marine Corps aircraft and ships, establishing human tolerance limits to these forces, and developing approaches to minimize their adverse effects.

WE WILL STRIVE CONTINUALLY to conduct the highest quality research to improve the safe and effective performance of Sailors and Marines.

NBDL VISION

WE ARE COMMITTED to providing a research facility dedicated to excellence in which:

THE NAVY AND MARINE CORPS consider NBDL the first source of scientific information relating to impact acceleration and the effects of ship motion on human performance.

BIOMEDICAL RESEARCH ORGANIZATIONS respect the Naval Biodynamics Laboratory as a world leader in conducting biodynamics research.

OUR LABORATORY PROFESSIONALS view the Naval Biodynamics Laboratory as a superior environment for realizing their professional growth and satisfaction.

OUR HIGHER ECHELON COMMAND regards the Naval Biodynamics Laboratory as the model command supporting the Navy Medical Department's strategic goals and objectives.

OUR PEOPLE view themselves as empowered members of one of the world's finest biodynamics research teams.

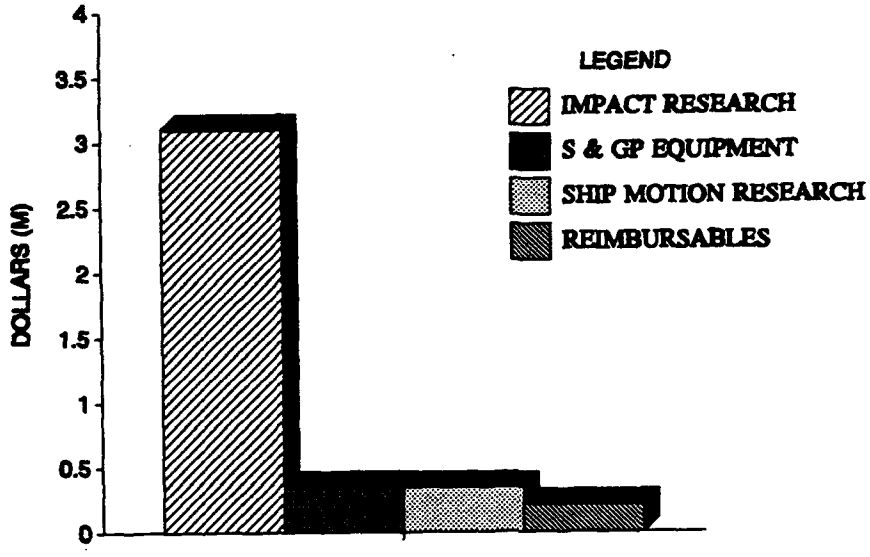
NBDL GUIDING PRINCIPLES

WE EXIST to ensure the best performance from and prevent injury to our Sailors and Marines.

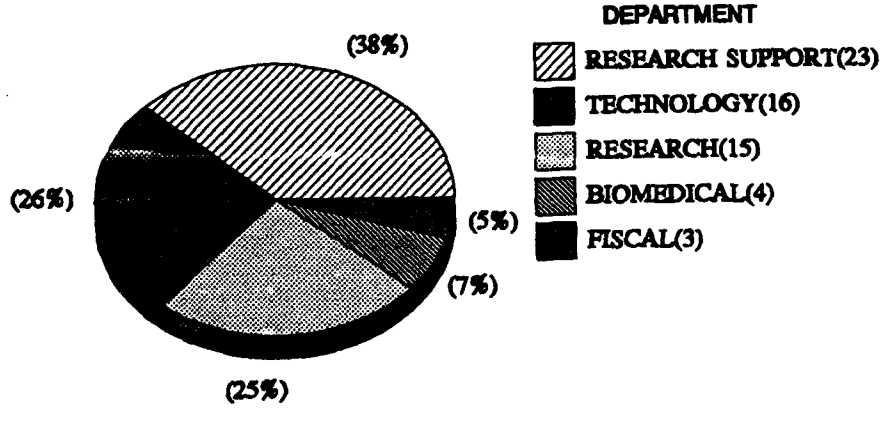
WE WILL support the combat readiness of the Navy and Marine Corps. Maintain pride and quality in all our work. Earn the trust and confidence of our customers by enthusiastically providing prompt responses to their operational research requirements. Share the results of our research with the international scientific community. Be responsible members of our civilian community by providing civic support whenever possible.

WE CARE about each other just as we care about our work. This is the basis of the mutual trust and respect that must exist for us to succeed.

TOTAL FUNDING (1993)

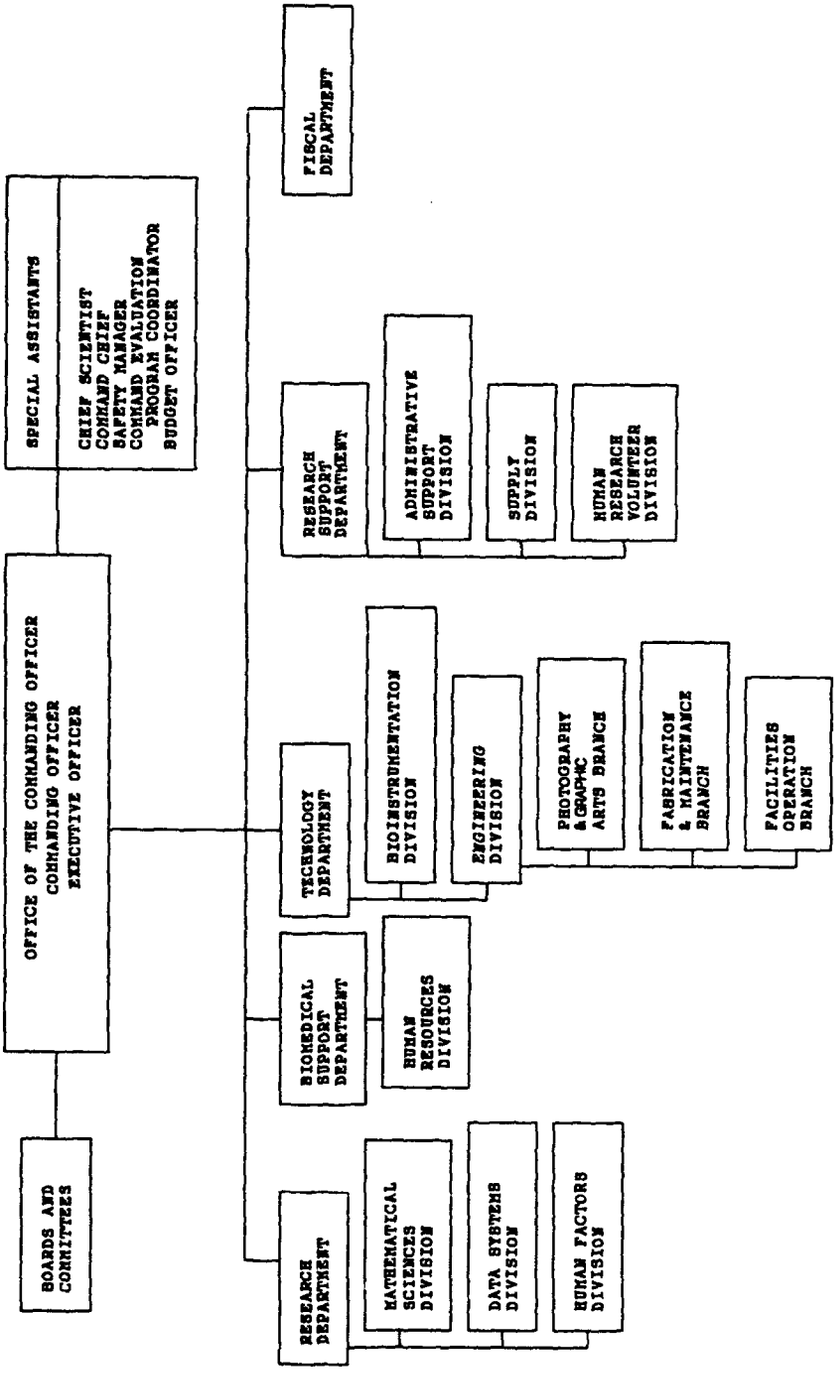


AVERAGE PERSONNEL STRENGTH (1993)



ORGANIZATION CHART

NAVAL BIODYNAMICS LABORATORY



OFFICE OF THE COMMANDING OFFICER

The Laboratory is directed by the Office of the Commanding Officer. The office is composed of the Commanding Officer, Executive Officer, Chief Scientist, Command Chief Petty Officer, Safety Manager, Command Evaluation Program Coordinator and support personnel. The Commanding Officer is under the military control of the Commanding Officer, Naval Medical Research and Development Command, and is responsible for the command organization, and management of the Laboratory to conduct its mission in the most effective and economical manner possible. The Commanding Officer is a member of the Navy Medical Department.

CDR Robert W. Rendin, MSC, USN

COMMANDING OFFICER'S STATEMENT

The year 1993 was productive, challenging, and dynamic, yet surrounded by uncertainty related to Laboratory collocation initiatives and the overall military drawdown. Perhaps the most obvious sign of progress at NBDL was that after almost twenty years of conducting human research for the Navy, the first women were recruited and reported on board as research volunteers. This decision to include women was based on a scientific interest in detecting, measuring and understanding gender differences related to human response to mechanical forces. These first groups of women have also been completely integrated in all staff support departments of the command. They will serve the navy well, as female sailors expand their presence and importance in military operational assignments into the next decade and beyond.

We also chartered a very different course for conducting, managing and leading the Naval Biodynamics Laboratory into a more efficient and productive command. This is being accomplished by embracing the principles of Total Quality Leadership, a long term commitment to change. We have trained our staff, then developed a new strategic plan, vision, and guiding principles. Five Quality Management Boards were formed to improve our processes for attaining our strategic goals.

Our presence in the scientific community was enhanced through increased involvement and presentations at scientific meetings and symposia. We also became better recognized by the creation of a command display, part of our overall strategy to more aggressively market the Laboratory to potential new sponsors, military and civilian.

Our Human Factors Research Program was extremely active in a variety of projects and enjoyed continuing sponsor support from NATO countries and the Naval Surface Warfare Center. Work for the U.S. Coast Guard provided valuable data for evaluating design of their next generation vessels. In addition, a mobile biodynamics laboratory for the Anti-Motion Sickness Training Program was built and is ready to aid in the field validation of the program and for subsequent fleet transfer.

A renewed emphasis on people at NBDL resulted in a more skilled workforce. Innovative "platform based" training for our sailors helped them to achieve remarkable success in rating qualification and in selection for promotion. For our civilians, we embarked on an initiative to take advantage of a variety of training opportunities through innovative and creative internal and external training courses.

While staying focused on mission, we remained in touch with our tradition and history of being active and involved members of the surrounding community. Our Partnership in Education Program with Schaumburg Elementary School in New Orleans continued unabated and received extremely favorable media recognition. We also participated in many other community functions, including Louisiana Special Olympics.

Next year will bring some uncertainty and many more challenges, but we are prepared and poised to meet them and succeed. Our vision for the Laboratory is strong and our people are ready!

CDR L. W. Schoenberg, MSC, USN,
Executive Officer

Dr. Marc S. Weiss,
Chief Scientist and Head,
Research Department

Mr. Gilbert C. Willems,
Head, Technology Department

CDR T. G. Anderson, MC,
USN, Head, Biomedical
Support Department

LT K. E. Rice, MSC, USNR,
Administrative Officer and
Head, Research Support
Department

Ms. Severina Garcia,
Head, Fiscal Department

YNCS S. M. Rogan, USN,
Command Senior Chief

EXECUTIVE OFFICER

The Executive Officer is responsible to the Commanding Officer for the routine management of the command. All orders originating from the Executive Officer are considered as coming from the Commanding Officer. The Executive Officer serves as the direct line supervisor for the departments, manages and facilitates the editorial review of reports and speeches, and exercises fiscal authority as granted by the Commanding Officer. He assumes overall responsibility for command civilian personnel matters and coordinates the submission of the Command History. The Executive Officer is a member of the Navy Medical Department. He chairs numerous Laboratory boards and committees: Protection of Human Subjects, Credentials Review, Safety, Position Management, Sailor of the Quarter/Year, Civilian of the Quarter, and Information Systems.

CHIEF SCIENTIST

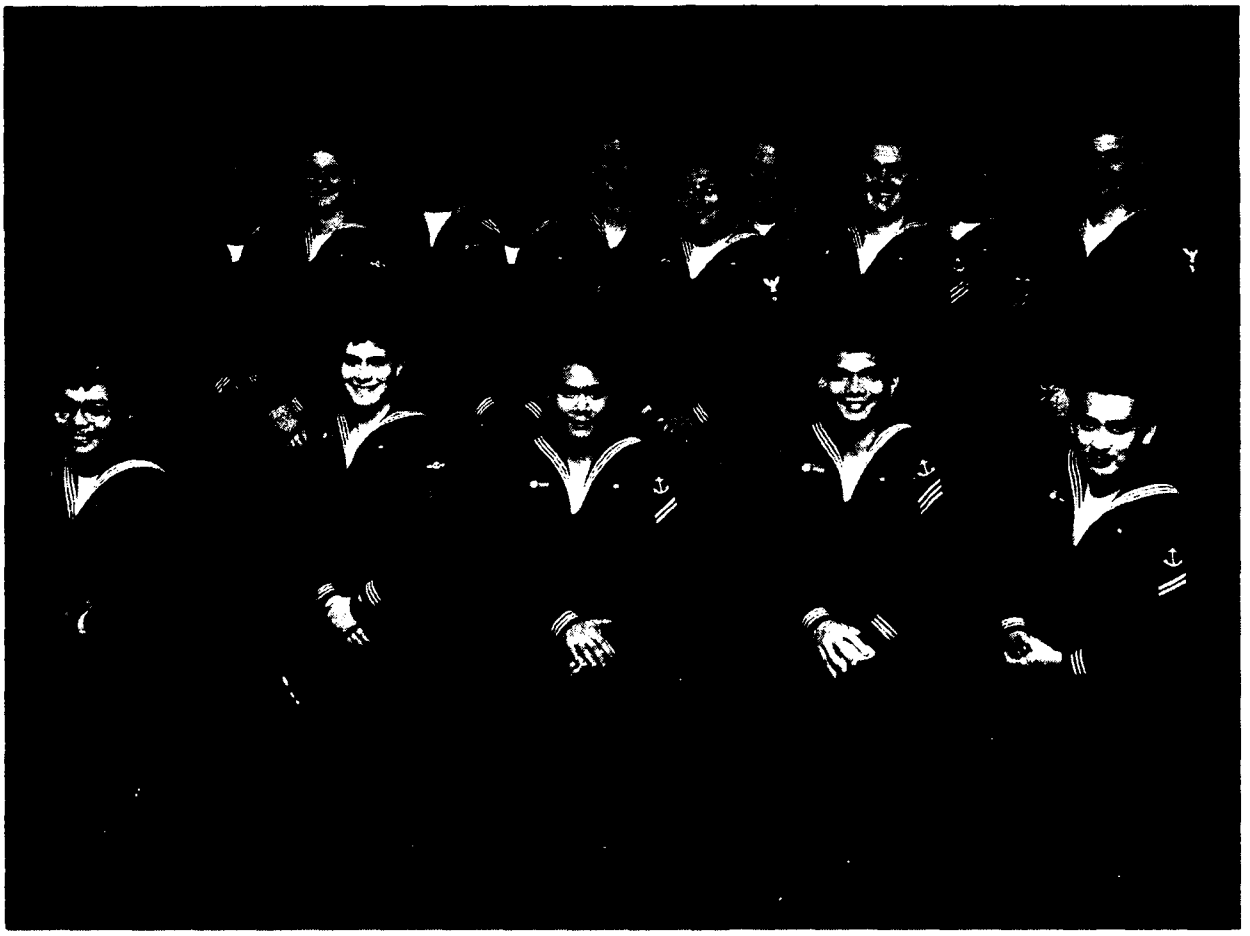
The Chief Scientist (CS) serves as principal advisor to the Commanding Officer on the status, plans, and direction of the command's scientific programs. The CS organizes and maintains program documentation which provides maximum information to the Commanding Officer to assist him in managing long range programs and assure the flexibility to initiate prompt research and development efforts in response to line identified fleet problems. The CS maintains liaison and coordination with the Director of Research and Development at the Naval Medical Research and Development Command. The CS is responsible for internal review and management of all research work unit proposals.

COMMAND CHIEF PETTY OFFICER

The Command Chief Petty Officer assists the Commanding Officer and the Executive Officer in matters pertinent to the morale and welfare of enlisted personnel and their family members. He performs duties as directed to ensure that policies and programs pertaining to enlisted personnel are disseminated, and maintains open lines of communication between the command and members of the enlisted community.

Human Research Volunteers

NBDL has twenty-one billets for Human Research Volunteers (HRVs). HRVs for the Laboratory are recruited from the Recruit Training Command in Orlando, Florida. All HRVs are junior enlisted personnel who have completed Apprenticeship Training. The normal tour length as an HRV is eighteen months. HRVs must meet rigorous physical standards before being accepted in the program. NBDL Instruction 3900.1E establishes the safety standards that research projects must meet to utilize HRVs. Every project involving HRVs must be reviewed by the NBDL Committee for the Protection of Human Subjects. The committee reviews experimental protocols and recommends approval, modification or disapproval of the project to the Commanding Officer. Final approval authority is vested in the Surgeon General, Bureau of Medicine and Surgery via the Commanding Officer of NMRDC. The HRVs are followed on a long term basis to determine if there are any lasting performance, physiological or medical effects due to impact acceleration exposure. When not involved as subjects in experiments, the HRVs work in all command departments thus greatly enhancing the efficiency of the Laboratory.



Human Research Volunteers

Facilities

The Naval Biodynamics Laboratory houses several unique motion devices. Among these are the horizontal accelerator, vertical accelerator, ship motion simulator, and motion desensitization chair and visual drum.

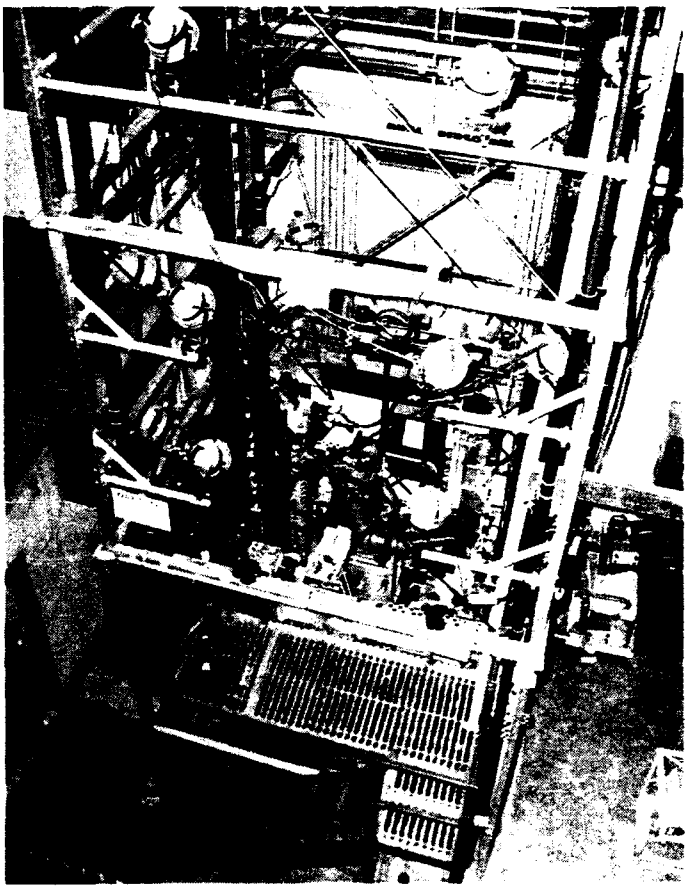
Horizontal Accelerator. The command's Impact Research Program is designed to investigate the effects of indirect impact forces on the head and neck, and their potential for producing injury. To achieve this, a 700 foot, enclosed, environmentally controlled horizontal acceleration test track has been in operation at NBDL since 1972. The track incorporates a thrust accelerator with a control console and uses several sleds. A sled is accelerated along the track with a Consolidated Vacuum Corporation, 12 inch Hyge system capable of generating 225,000 lbs of thrust. Dry nitrogen, provided by NASA, delivers the needed pressure to trigger the sled. The sled is decelerated by friction forces ranging from 2 to 4 meters per second squared. Two sleds are currently in use, a Z-axis sled and an omni-directional sled containing a turntable, capable of rotating 360 degrees. Several important safety systems are in place to protect HRVs, technicians, and equipment. All the safety systems work independently and triggering any one will automatically shut down the system.

HRVs are given non-injurious impact accelerations. During these tests, angular and linear displacements, velocities, and accelerations of selected body segments are measured in three dimensions by man-mounted transducers. Physiological data including somatosensory evoked potentials, electroencephalogram (brain waves), electrocardiogram (muscle recordings) and respiratory patterns are recorded and analyzed. Mechanisms of central nervous system injury have been derived from similarly instrumented primates.

Currently, acceleration data are collected by a Hewlett-Packard 9000/220 computer and analyzed by a Hewlett Packard 9000/835 computer. High speed instrumentation cameras record the motions of HRVs. A computer based photodigitizing system scans the film with automatic pattern recognition algorithms, determines the changing X and Y position of photo targets mounted on the HRV during the acceleration, and writes the results to a magnetic tape. The analysis combines the measured photographic and inertial data with sensor position and alignment, sensor calibration, camera position and alignment, camera optical calibration, photo target position, and standard anatomical coordinate systems based upon X-rays of each HRV. Motion of the HRV is determined independently from photographic and inertial data, and the results are compared for agreement as a final check of data integrity.

Horizontal Accelerator

Vertical Accelerator. The Laboratory studies human response to impact by also using a nitrogen powered vertical accelerator which propels a restrained HRV or manikin on an instrumented carriage along a 42-ft vertical track. The HRVs are initially exposed to low levels of acceleration which are increased in increments of a single "G" within a well established safety range. Before, during, and after each sled run, a physiological data acquisition system is used to collect and analyze physiological measurements and to medically monitor and provide information concerning human response to impact. Although numerous $+G_z$ (or axial impact) experiments have been conducted on supine HRVs using the horizontal accelerator, the vertical accelerator allows a more realistic investigation of the biomechanical effects of forces similar to those produced by an aircraft ejection seat. Similar to the horizontal accelerator, the vertical accelerator force can be regulated to produce different onset thrusts. The vertical accelerator has also been used to simulate forces encountered aboard Navy ships during underwater explosions.



Vertical Accelerator

Ship Motion Simulator. A unique device at NBDL is the ship motion simulator (SMS). The SMS is capable of simulating ship motions in weather conditions of up to sea state five with three degrees of freedom - heave, pitch and roll. The SMS is driven by a hydraulically powered piston, the motion of which is controlled by modulating the hydraulic flow via a servovalve-controlled actuator.

The moving system, consisting of the cab and the carriage, is guided along rails attached to a support tower. It carries a double yoke and trunnion system, operated under similar but independent control, that permits roll and pitch motions to be superimposed, singly or in combination, upon the vertical translational (heave) oscillation. The hydraulic power is delivered by a combination of up to four drive pumps located in a separate building.

A 900 gallon-per-minute hydraulic pump provides a heave acceleration of +2.0 g(z) to -0.92 g(z), a velocity of plus or minus 17 feet per second and a displacement of plus or minus 11 feet. A second high pressure, low volume hydraulic pump powers pitch and roll actuators that permit accelerations of plus or minus 150 degrees per second squared for acceleration with a rate of plus or minus 25 degrees per second and a displacement of plus or minus 15 degrees. The descent of the carriage during the heave downstroke is gravitational and limited by friction to approximately 0.9 g. Numerous fail-safe features are in place to prevent the cab and support from falling or crashing including feedback transducers that transmit position information to the control system. Should any of these numerous safety interlocks be triggered, the system automatically shuts down.

Emergency shutdowns can be automatically or manually executed if pumps become overheated, valves become stuck, or system monitors fail. HRVs and researchers also have the capability to shutdown the system by pressing emergency stop buttons located in the motion cab and at the control console.

The SMS is supported by a Zenith/386 microcomputer and a Hewlett-Packard 6942A Microprogrammer. Selected motion data are loaded via the microcomputer into the 6942A format required to drive the SMS. The microcomputer is also used for digitization, storage, and subsequent analysis of motion or other data from the SMS.

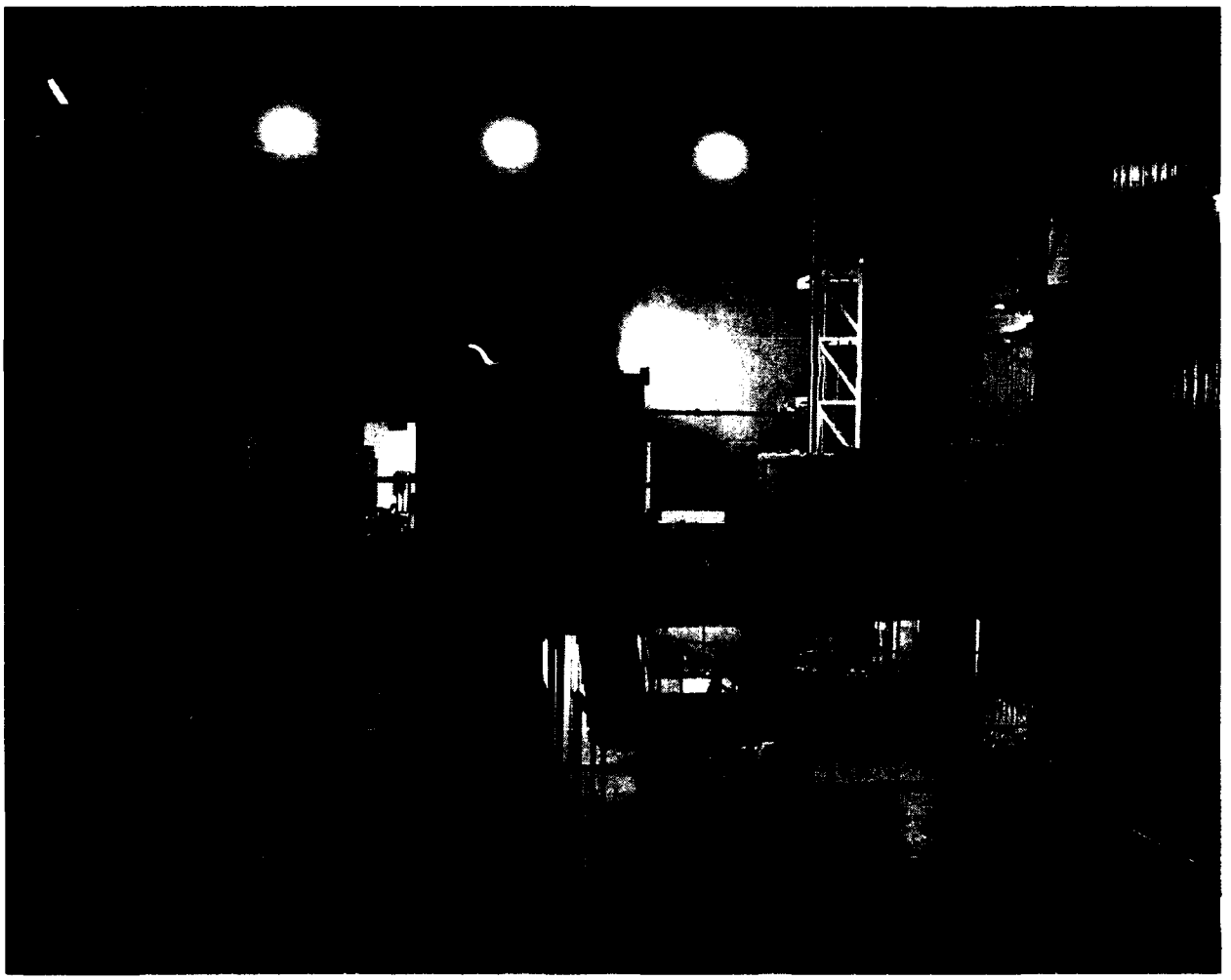
A dedicated 14-channel, FM analog tape recorder is available for data collection and/or playback into the SMS. Data are collected via accelerometers and rate sensors which are placed at various points in a ship's hull. The direction of placement determines the type of motion recorded, i.e., heave, pitch or roll. Mathematical formulas can be used to calculate motion effects at any point in the ship. Usually only a portion of the recorded motion is used and it is repeated continuously to create a smooth motion profile. Sinusoidal or simulated at-sea motion synthetic drive signals can also be generated via three dedicated Hewlett-Packard 3314 Arbitrary Function Generators.

The SMS can accommodate a total payload of 5000 pounds, including the moving cab and up to three HRVs. The SMS cab is an 8-ft cube with the forward top edge truncated to accommodate forward pitch motion adjacent to the tower. In its standard configuration, the air-conditioned cab is windowless; however, view ports can be installed if necessary.

HRVs are continuously observed at the control station by means of closed-circuit TV; two-way communication is conducted via an audio system. The cab can be fitted with up to three forward-facing seats with safety harnesses and with parallel, facing bench type workstations equipped with video display terminals and other performance tests. HRVs

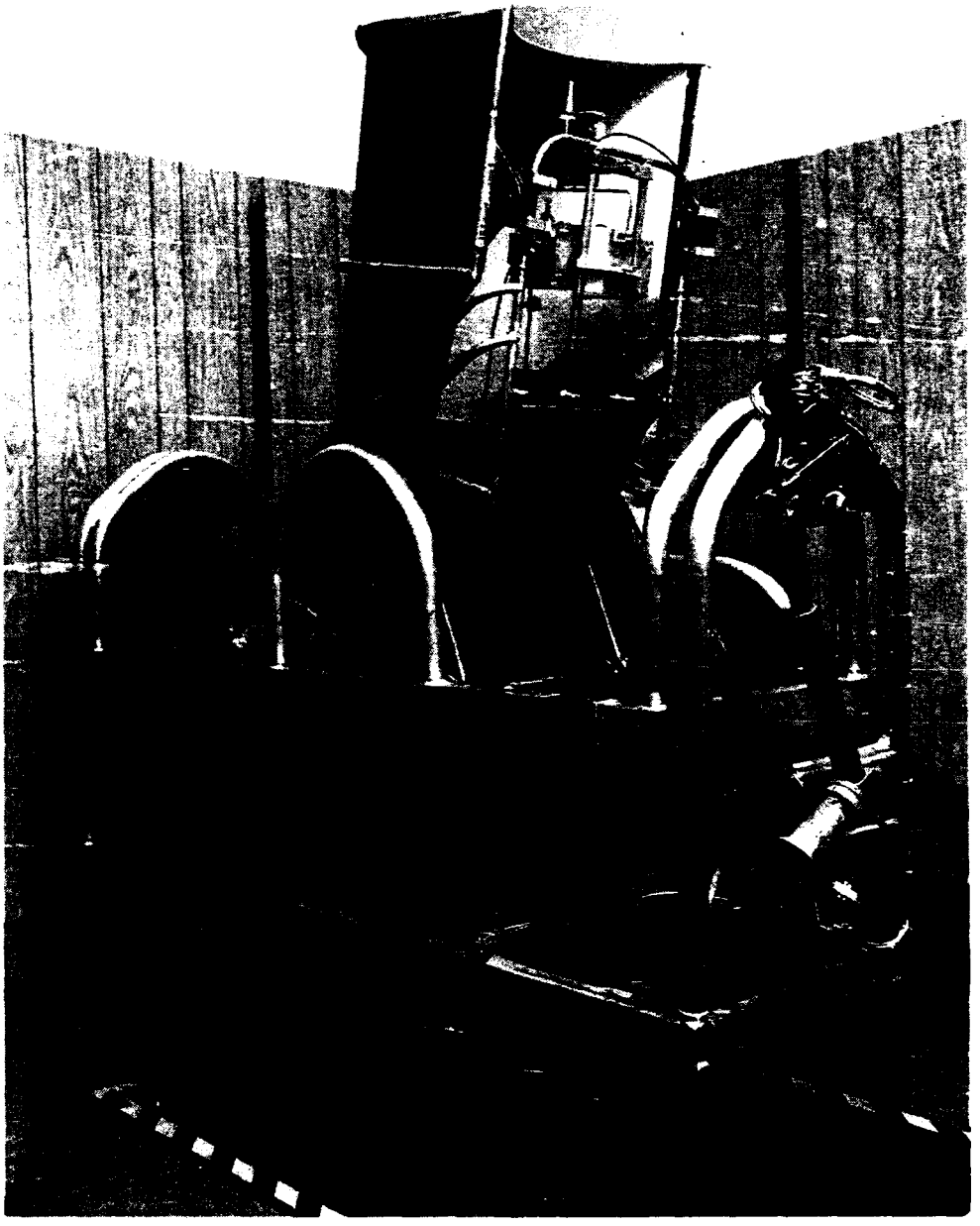
can stop a testing session at any point by activating a safety switch on their console. The cab is also equipped with biomedical instrumentation to monitor: ECG, EEG, respiration, pallor, and other physiological measurements.

In conjunction with the moving cab, a fixed, dimensional replica of the motion cab is available. The static cab's test station is identical in equipment and configuration. The interiors of both have been carefully matched in terms of painting, lighting, air-conditioning, experiment equipment, and other relevant variables. The static cab is frequently used for baseline training and testing prior to testing in the motion cab.



Ship Motion Simulator

Motion Desensitization Chair. A three-axis/tilt/rotation chair capable of producing a myriad of motions is used to desensitize subjects to motion environments. This device combined with a cognitive/behavioral training program has been used to successfully treat subjects suffering from intractable motion sickness. In addition to the motion desensitization chair, a visual rotation drum designed to create coriolis stimulation is housed at the University of New Orleans. This device is used in conjunction with the aforementioned cognitive/behavioral training program to alleviate the effects of motion sickness.



Motion Desensitization Chair

RESEARCH DEPARTMENT

Department Mission and Functions

The Research Department designs, plans, conducts, and analyzes all experiments involving impact acceleration and platform motion required to meet program goals and Navy needs and requirements. The Department is responsible for: specifying requirements for biomedical instrumentation and biomedical data; assisting other Departments in evaluating and interpreting analytical, numerical, and statistical data; evaluating physiological and pathological injury models; and critically evaluating protective standards derived from the impact and motion database. The Department has three divisions--Human Factors, Mathematical Sciences, and Data Systems.

MATHEMATICAL SCIENCES DIVISION

Division Mission and Functions

The Mathematical Sciences Division conducts original scientific work in the area of biodynamics and mathematical sciences, and supports other departments in the development and use of all analytical, numerical and statistical procedures to analyze research data.

Work Unit. 63216N M0097.001. **"Determination of Human Dynamic, Injury, and Performance Response to Impact Acceleration and Development of Validated Manikin Components."**

Principal Investigator: Salvadore J. Guccione, Jr., Ph.D.

Associate Investigators: Marc S. Weiss, Ph.D. and Mr. Gilbert C. Willems

The Naval Biodynamics Laboratory is investigating human head and neck response to whole body linear accelerations to further define the dynamic responses of these anatomical segments to impact forces; determine the relationship between the dynamic and physiological responses and injury potential; and to develop validated computer models of human head and neck biodynamic and physiological responses to impact.

Significant Accomplishments and Research Findings: The first female subjects for human research were qualified. A unisex human restraint was designed. The unisex human restraint system was successfully tested on the horizontal accelerator in eight tests using the Hybrid III manikin.

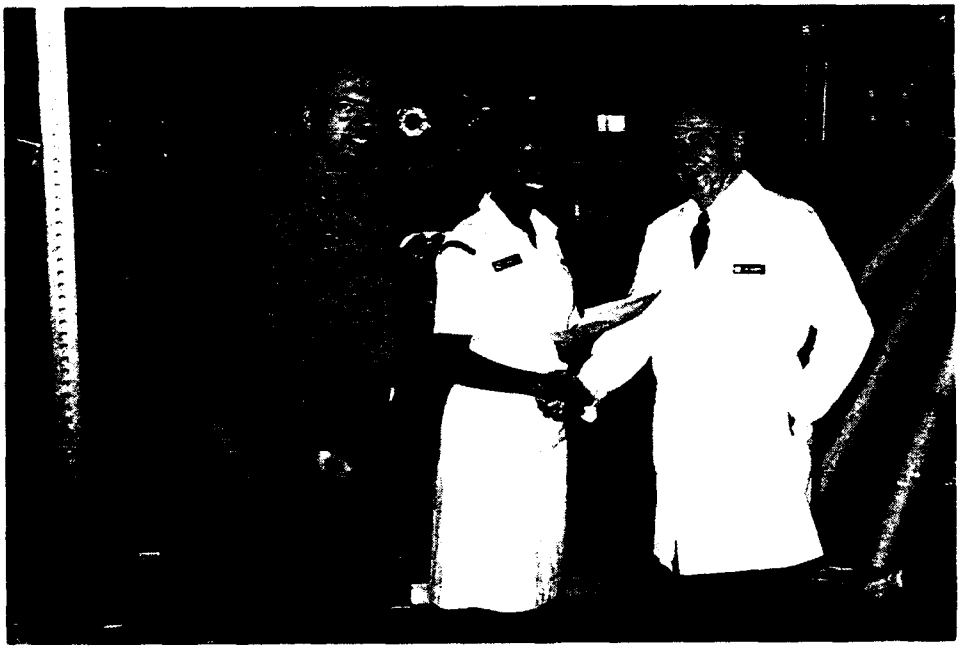
The present vertical impact series was suspended after learning of a herniated thoracic disc in an HRV 15 months past exposure. An intensive review and analysis of exposure was undertaken to ascertain the presence or absence of a direct relationship. Six long-term medical follow-up examinations were conducted on former research volunteers. Critical kinematic and dynamic parameters were measured. Somatosensory evoked potential data gathered throughout the acceleration exposure were also evaluated with no significant findings.

A series of fourteen experiments was conducted using the Hybrid III manikin on the Horizontal Accelerator to test a new ("unisex") restraint harness design. An additional six experiments using the Hybrid III manikin were conducted on the vertical accelerator to demonstrate the command's capabilities to visitors.

A series of experiments was begun on the horizontal accelerator to determine the effect of neck wear on the dynamic response of the Hybrid III manikin. Twenty-eight experiments have been completed at three "g" levels, in both the +X and -X vector directions, to compare a "well-used" manikin neck with a previously unused neck. Full inertia head instrumentation and high speed cinematography are being used to monitor these experiments.

Criteria are systematically being developed to improve the quality of data analysis of human evoked potential responses to indirect impact acceleration. In non-human primates, these responses change in accordance with acceleration levels and are possible pre-indicators of injury. Similar experiments with humans are conducted with less invasive, therefore poorer, data acquisition methods. Analysis done this year demonstrated that standard analysis methods provided unreliable results in our human data. Furthermore, simulation experiments clearly documented the performance limits of these methods; these limits were outside the range of our human data characteristics. A set of criteria was determined for evaluating promising data analysis improvements currently under development. We began applying adaptive filtering techniques to the problem and evaluating them with these criteria.

The impact acceleration research continues to be documented in presentations academic, military, and scientific organizations.



The first female subjects were qualified for human research in 1993

Contributing to research accomplishments and findings were contracted efforts as follows:

"Assessment of Cardiac Dynamic Following Frontal Impact in Non-human Primates." A collaboration has begun to determine whether the severity of injury subsequent to indirect impact acceleration can be non-invasively determined by perturbations in heart rate. Newer methods of analysis employing spectral (Fourier) analysis and techniques derived from nonlinear dynamics ("chaos theory") are being applied as a sensitive way to assess beat-to-beat changes in cardiac function. The scope of the experiment was defined and data sharing methods were worked out.

"Photogrammetric Procedures and Data Quality Control." The primary objective of this contract was to optimize the photoinstrumentation mount geometry to enhance accuracy and efficiency of processing acquired X-ray and photographic data. Standard procedures for the acquisition, digitization, processing and record keeping of various types of photogrammetric data and the subsequent production of in-house technical memoranda were developed. Customized error graphics software package for efficient troubleshooting of X-ray and photographic data collection and processing errors was delivered.

Precision digitization and processing of photogrammetric data is performed in support of research projects

HUMAN FACTORS DIVISION

Division Mission and Functions

The Human Factors Division designs, conducts, and analyzes experiments on the interactions of human operators and military operational environments, and uses the data generated from these experiments to develop human factors engineering standards and specifications for military systems. The Division also conducts in-house and field projects on motion and its effects on performance, and develops and validates techniques to reduce the adverse effects of motion on humans in the military environment.

The Division is responsible for determining the effects of the inertial environment on the operability of military weapons platforms. It assumes overall responsibility for the operation of the ship motion simulator (SMS) and formulates plans for use of this device. The coordination of air and sea field projects falls under the authority of the Division. The Human Factors Division also performs research in conjunction with other governmental and non-governmental organizations. The Division focuses on identifying the effects of low frequency oscillatory motion on human operator performance in combat systems operations. Areas of special interest are cognitive and psychomotor performance during adverse conditions and biodynamic stress encountered on naval vessels.

Work Unit. 63706N M0096.002. **"Protection of Naval Personnel from Motion Sickness and Other Adverse Motion Effects."**

Principal Investigator: F. Douglas Holcombe, LCDR, MSC, USN

Associate Investigators: David L. Matson, Ph.D. and Sharon L. Conwell, LT, MSC, USNR

Significant Accomplishments and Research Findings: The American-British-Canadian-Dutch (ABCD) Working Group met at the Naval Biodynamics Laboratory 9-11 February to discuss progress on the Cognitive Performance Assessment Study which used the NBDL Ship Motion Simulator. Members also discussed Motion Induced Interruptions (MII) data analysis progress and the outline for the final report of this project.

Cognitive Performance Assessment Pilot Study Completed. Battelle Memorial Institute is under contract with NBDL to select psychomotor and cognitive performance tests for inclusion in a provisional test battery. The battery was delivered and prepared for use in the SMS. Carderock Division of Naval Surface Warfare Center developed and delivered the SMS profile used in the cognitive performance assessment pilot study. Thirteen subjects completed 20 static and 20 motion experimental runs from 8 February - 18 March 1993. Subjects completed over 60 paper-and-pencil, computerized, and psychometer tests measuring 29 human abilities. Results were discussed at the ABCD working group meeting in Bath, England in April.

Cognitive-Behavioral Anti-motion Sickness Training Program readied for cooperative validation study. Assembly of a motion-desensitization training system has been completed. A monograph has been completed which will serve as the core of a

counselor training handbook. A memorandum-of-understanding between the Naval Biodynamics Laboratory and the Naval Health Research Center has been drafted. A survey of potential users has been prepared. The trailer which will house the NBDL motion-desensitization training system has been delivered. Major enhancement of the rotating chair assembly has been completed which corrected a fundamental design fault. The control rack has been assembled, and wiring is in progress. Detailed protocols for the validation study are being worked out between the Naval Biodynamics Laboratory and the Naval Health Research Center. The first survey of potential users (the landing craft air cushion community) has begun at ACU-5, Camp Pendleton, California.

Motion Sickness Research Study Enters Phase Two. Over 157 focus-of-attention experimental exposures were performed on our subject pool this period. The purpose of the study is to test the hypothesis that changes in attention can change susceptibility to motion sickness. Navy enlisted personnel assigned to the Naval Biodynamics Laboratory participate in a series of sixteen (phases one and two) or 24 sessions (all three phases) for approximately ten minutes per session. The phases are numbered to correspond to the number of tone types the subjects are to count (low, medium, and high pitch). At the completion of phase two a statistical significance test will be performed to determine the necessity for phase three. Their motion-sickness symptomatology changes will be assessed using a standardized checklist completed before and after each scheduled exposure.

Motion-Induced Interruptions (MII) Study. The ABCD Working Group met in Washington, D.C. in July to review inputs to the MII final report and plan its conclusion. Several lengthy analyses will be performed during the next year and reported later. NBDL will distribute the final report. The success of the MII study will assure continued interest in the project and demand for more data on performance degradation. One project contributor, who was also working with the U.S. Coast Guard to develop specifications for a replacement boat, has already employed the MII data in the effort to develop more sophisticated and detailed acquisition specifications.

Research Volunteer is being prepared to enter the Ship Motion Simulator for a study of Motion Induced Interruption

Cognitive Performance Assessment Main Study Performed. The final cognitive performance assessment test battery was completed and delivered by the contractor, Battelle Memorial Institute. After extensive in-house review, most portions of the battery were installed in the ship motion simulator. Additional reviews were made by the ABCD Working Group. Due to insufficient numbers of in-house Human Research Volunteers, subjects were recruited from various area commands. About forty subjects completed the test battery. A revision of the experimental protocol should permit additional data collection in the second quarter of FY 94. Expanded international interest in the physical and cognitive performance assessment studies is expected to result in additional countries and organizations becoming regular contributors via NATO Naval Armaments Group subgroup activities. These matters were discussed at the ABCD working group meeting at the TNO Institute for Human Factors, Soesterberg, The Netherlands.

DATA SYSTEMS DIVISION

Division Mission and Functions

The Data Systems Division specifies, acquires, develops, maintains, and operates systems and procedures used for collecting, reducing, and analyzing data related to the impact and motion research programs.

Significant Accomplishments and Research Findings: Data Systems personnel installed various 486 computer systems throughout the Division to enhance its ability to process experimental data. Installed a Novell network for Research Support Department to support the administrative functions of the command. Performed various automated data processing functions to support Fiscal Department in meeting command mission goals. Provided timely ADP support to all Laboratory users.

BIOMEDICAL SUPPORT DEPARTMENT

Department Mission and Functions

The Biomedical Support Department provides professional and technical support for all biodynamic experiments using human research volunteers. It provides professional advice and control in experiments using HRVs and in the selection for experimental purposes. The Department selects and schedules the use of HRVs in all experiments as required by the principal investigators. The Department also provides medical support for all HRVs used within the Laboratory's scientific programs. The Department provides hematology, pathology, and X-ray services for all HRVs used in scientific experimentation and is also responsible for the long-term follow-up of HRVs.

Significant Accomplishments and Research Findings: As a result of our Research Medical Officer's encouragement and initiative, approval was obtained for seven presentations and poster sessions at the 1993 Annual Scientific Meeting of the Aerospace Medical Association (AsMA). Our Research Medical Officer also served on the AsMA Scientific Committee for 1993. These presentations ensured wide representation of the Laboratory's scientific and technical capabilities. The first female human research volunteers were medically qualified for participation in acceleration research. This will allow the acquisition of the first data on the female head and neck response to indirect impact acceleration on the horizontal accelerator. The Department provided medical coverage throughout the year for several experimental protocols, with zero injuries and a flawless safety record.

TECHNOLOGY DEPARTMENT

Department Mission and Functions

The Technology Department oversees the activities of its two component divisions, Bioinstrumentation and Engineering. The Department provides electrical and mechanical engineering support for experimental requirements as specified by other departments, researchers, and the Chief Scientist. This support consists of mechanical design and fabrication of experimental devices, design and construction of electrical/electronic systems for device motion control, photographic systems, and acquisition of inertial and physiological data. The Department also installs and maintains the Laboratory's personal computer systems and supervises new facility construction and repair or renovation of existing facilities.

ENGINEERING DIVISION

Division Mission and Functions

Provides design, operation, and maintenance support for the mechanical facilities and equipment of the Laboratory; operates and maintains linear acceleration systems including initial configuration and construction of sleds, seats, restraint systems, camera mounts, etc.; operates and maintains platform motion facilities; and configures the ship motion simulator and the vibration devices for specific experiments. Develops, adapts, and modifies specialized cameras (such as high speed photometric movie cameras) to specific experimental situations involving high acceleration and oscillatory motion; operates and maintains all high speed and special cameras, documentary cameras, and audiovisual equipment in the Laboratory. Supports Laboratory projects through the operation of well-equipped machine and woodworking shops. Constructs or supervises the construction of new facilities required for the conduct of research. Coordinates engineering functions with the other departments through the Head, Technology Department.

BIOINSTRUMENTATION DIVISION

Division Mission and Functions

Provides instrumentation designs for human and human surrogate impact acceleration and platform motion experiments. The Division is responsible for installing, operating, and maintaining complete data acquisition (analog and digital) systems employed in the experiments conducted by the Department, and provides electronic/electrical operation and maintenance support for the Laboratory's experimental devices. It is also responsible for the configuring of field data measuring and acquisition systems for use aboard ships or at other field locations.

Significant Accomplishments of the Technology Department: A new "unisex" human restraint harness system has been designed and tested on the Horizontal Accelerator. The impetus for this was the arrival of the first female Human Research Volunteers. Preliminary evaluation of the tests indicated that the new harness provided a response significantly different from prior ones. The attachment points were redesigned

and subsequent tests showed significant improvement in response.

An intensive effort was undertaken to complete the mobile version of the motion desensitization chair which is to be used in support of the training program for cognitive-behavioral motion sickness desensitization efforts. This effort was completed on schedule and the system installed in a trailer procured for this purpose. The effort included a major redesign of the spin drive system; also because of anticipated logistic problems with maintenance support during field operations, the philosophy of 100% redundancy was adopted. A complete set of duplicate control circuitry was built and spare actuators, drive motors, and actuator controller were procured.

This Department executed a reimbursable work unit (93WR10706) in support of the Coastal Systems Station of the Naval Surface Warfare Center, Dahlgreen Division. The purpose of the test series, conducted on the ship motion simulator, was to assess the change in liquid helium boil-off resulting from induced at-sea motion. The amount of variation in boil-off would influence the sizing of a storage Dewar (thermally insulated container) on a mine countermeasures ship. Liquid helium is used to cool the sensor in a state-of-the-art mine detection system. The test series was highly successful with positive results: no increase in boil off was found, indicating that commercial Dewars rather than aerospace grade ones can be used, resulting in substantial cost reduction.

An experimental series was conducted on the horizontal accelerator to determine the effect of neck wear on the dynamic response of the Hybrid-III dummy head. The dummy was run with a "well-used" as well as previously unused neck. Tests were conducted at three "g" levels in both the +X and -X vector directions, and full inertial head instrumentation as well as high-speed cinematography were used. Analysis of the resulting data is in progress.

Two lightproof single-degree-of-freedom (roll) capsules, designed for human testing at the Naval Aerospace Medical Research Laboratory in Pensacola, FL were completed. Both were proof-tested on the horizontal accelerator. After successful completion of the tests they, as well as a summary report and complete data package, were delivered to NAMRL and installed.

A reimbursable work unit (P.E. #63561N) "Dummy Response to +Z Short Duration Impact Experiments" was executed for the Underwater Explosion Research Division of the Naval Surface Warfare Center. A fully instrumented Hybrid-III dummy was installed in a raft at Rustburg, Virginia and twelve shock experiments successfully conducted and test data as well as a summary report were provided to the sponsor.

Since the tape cleaner became operational, approximately 170 electrocardiogram records were retrieved from archival data and hard copies generated for the Biomedical Support Department. Because of the degraded state of the analog tapes, the data were simultaneously digitized and preserved in diskette media. Since then the Bioinstrumentation Division has been active in cleaning/conditioning all magnetic tapes containing archived physiological data. These procedures should extend the life of the

data as well as increasing the efficiency of data recovery.

The Bioinstrumentation Division greatly enhanced its instrumentation capability. General purpose equipment funding was used to procure: (1) Video equipment to enhance our subject monitoring capability during experiments; (2) New analog and digital oscilloscopes for data monitoring and design/development/repair of electronic systems used in experiments throughout the Laboratory, (3) State-of-the-art chart recorder/data acquisition systems to enhance the Division's data acquisition capability. In addition, a second inertial signal conditioning system was procured and installed on the horizontal accelerator. This addition obviates the need to move packages from one accelerator to the other, thus rendering changeover between devices more efficient.

Efforts were begun to integrate the Optotrack three-dimensional infrared tracking system with the vertical accelerator. A major task in this effort has been the acquisition and installation of infrared optical filters on the lights used to illuminate the test subjects.

The Technology Department's two divisions provided personnel and equipment to support 377 experiments on NBDL devices as follows:

a. 79 human experiments on the ship motion simulator in support of the cognitive phase of the CANUKUS program.

b. 49 experiments on the ship motion simulator in support of the liquid helium Dewar experiments.

c. 29 experiments on the horizontal accelerator in support of the proof testing of the lightproof one-degree-of-freedom capsules built by NBDL for NAMRL.

d. 157 human experiments on the motion desensitization chair in support of the Focus-of-Attention Program.

e. 26 dummy experiments on the horizontal accelerator in support of the "unisex" restraint harness design.

f. 9 experiments on the vertical accelerator in support of the Laboratory's public relations efforts and validation of a data acquisition system used in ship shock experiments.

g. 28 dummy experiments on the horizontal accelerator on support of the neck wear study.

RESEARCH SUPPORT DEPARTMENT

Department Mission and Functions

The Research Support Department provides administrative services and support to all departments of the command, coordinates administrative and clerical support services, provides coordination with other departments concerning administrative and financial matters, maintains and reviews all support agreements and memoranda of understanding, and is responsible for the efficient operation of its divisions.

ADMINISTRATIVE SUPPORT DIVISION

Division Mission and Functions

Coordinates matters relating to official incoming and outgoing correspondence, reports and messages, and maintains a correspondence control file. Updates and controls the command directives files, and maintains current Navy instructions. Administers routine civilian personnel matters and functions; coordinates liaison with the Human Resources Office (HRO). Responsible for the submission of all reports relating to civilian personnel matters.

Significant Accomplishments: The Laboratory's first dedicated local area network (LAN) computer system was brought on-line for this Division. The LAN has proven to be very useful in transmitting messages electronically. The LAN allows all stations connected to the system to be serviced by one software package vice individual software programs.

A major contribution to the command's research marketing effort was made with the production of a full color ten page command brochure. Through text and photos, this brochure describes in full detail the command's capabilities.

The efficiency review study was updated to meet BUMED mandated format changes. Manpower changes were submitted to the Total Force Manpower Management System using the Total Force Management Change Authorization software. The resulting revised efficiency review was submitted to BUPERS via the Health Service Support Office in Norfolk, VA with zero discrepancies.

SUPPLY DIVISION

Division Mission and Functions

Uses appropriate sources for the procurement of authorized materials and services; performs materials handling and distribution; conducts stock/inventory control and shipping/receiving functions; maintains command plant property/equipment records, manages the in-house plant property and equipment program ensuring that inventory controls are executed.

Significant Accomplishments: During this year, a bar code tag printer and software were purchased allowing Supply personnel to generate bar code tags in-house. This eliminated the requirement to purchase bar-code tags from an outside source giving Supply personnel the ability to custom design our own. In conjunction, the Plant and

Minor Property Budgeting System (PMBS) software was brought on line. Since its installment, the PMBS program has allowed greater flexibility and ease in managing the command's inventory of 1,500 Plant and Minor Property items.

A computerized ordering system called the Multi-use File for Interagency News was initiated to order publications and supply items allowing for a much faster delivery of items being ordered. The expediency of ordering supplies was additionally increased by replacing the microfiche system with a CD-ROM reader and by receiving Management List Consolidated Stock Numbers for DOD and Navy Forms and Publications Stock Numbers on compact disc.

FISCAL DEPARTMENT

Department Mission and Functions

Directs formulation, justification, and administration of command fiscal and budgetary management policies, plans and procedures; establishes and enforces "in-house" budget, fiscal, and accounting control policies; coordinates allocation of both direct and reimbursable funds with program managers; Commanding Officer's advisor for payroll management, prepares the budget for submission to higher authority. Monitors financial operations and reports to the Commanding Officer on a continuing basis regarding the financial status of the command. Responsible for: utilizing appropriate guidelines established by Federal Acquisitions Regulations for the procurement of authorized materials and services; provides administrative, technical, and management authorities with factual data which meet NBDL reporting requirements.

Significant Accomplishments: The Fiscal Department implemented the Stars/Field Level, a new automated accounting system. The new system provides on-line fiscal reporting capabilities and eliminates much of the paperwork requirements of the old system. The Department Head and Budget Analyst completed formal training on the new procedures followed by an intensive hands-on training period. This occurred simultaneously with the receipt of one million dollars of project funds near the end of the fiscal year. In spite of extreme time constraints, the Department was able to meet all obligation rates, meet numerous required report deadlines, and complete over a quarter of a million dollars worth of purchase orders.

PROFESSIONAL MEETINGS ATTENDED IN 1993

Anderson, T.G., Aerospace Medical Association's Annual Scientific Meeting, Toronto, Canada, 23-29 May 1993.

Black, R., Safety Training Course, Orlando, FL, 1-5 August 1993.

Buford, M., Ship Shock Meeting, Washington, D.C., 27-29 January 1993.

Buford, M., Training Computer Course, Houston, TX, 11-15 July 1993.

Cammayo, V., NAVSUP Small Purchase Course, NAS Jacksonville, FL, 21-26 June 1993.

Conwell, S.L., ABCD Meeting on CANUKUS Project, Bethesda, MD, 11-17 July 1993.

Dedios, E., Emergency Medical Technician Course, NAS Millington, TN, 11 April - 1 May 1993.

Garcia, S.S., STARS/FL Customer Conference, Charleston, SC, 15-16 February 1993.

Garcia, S.S., BUMED STARS/FL On Line Training, Charleston, SC, 12-16 April 1993.

George, A., PMBS Information Class, Norfolk, VA, 17-20 May 1993.

George, A., DAPA class, Mayport, FL, 19-24 September 1993.

Gilreath, F., Ship Shock Trials, Lynchburg, VA, 9-15 August 1993.

Gordon, J., STARS/FL Customer Conference, Charleston, SC, 15-16 February 1993.

Griffin, A., Emergency Medical Technician Course, NAS Millington, TN, 11 April - 1 May 1993.

Guccione, S.J., 64th Annual Scientific Meeting, Aerospace Medical Association, Toronto, Canada, 25-27 May 1993.

Guccione, S.J., Articulated Total Body (ATB) Course at Wright-Patterson AFB, OH, 22-26 August 1993.

Guccione, S.J., Fall '93 TARP Technical Working Group (TWG) for Biodynamics Meeting, NAS Pensacola, FL, 27-28 September 1993.

Guccione, S.J., Head and Neck Symposium (SAE), Denver, CO, 8-10 December 1993.

Holcombe, F.D., DOD Human Factors Engineering Technology Working Group Meeting, Dayton, OH, 11-14 March 1993.

Holcombe, F.D., ABCD Meeting on CANUKUS Project, Bethesda, MD, 11-17 July 1993.

Holcombe, F.D., Tri-Service Working Group on Spatial Orientation Situational Awareness, Pensacola, FL, 28-29 September 1993.

Kaufman, B., Team Skills and Concepts Course as Part of Quality Advisor Training for TQL, Little Creek, VA, 3-14 May 1993.

Kaufman, B., Fall '93 TARP Technical Working Group (TWG) for Biodynamics Meeting, NAS Pensacola, FL, 27-28 September 1993.

Kaufman, B., IEEE-EMBS 1993 Conference, San Diego, CA, 26 October - 1 November 1993.

Kaufman, B., Non-Stationary Signal Analysis Workshop, San Diego, CA, 26 October - 1 November 1993.

Kaufman, B., Head and Neck Symposium (SAE), Denver, CO, 8-10 December 1993.

Knouse, D., Course on a computer program at Hewlett Packard, HP Education Center, Mt. View, CA, 19-26 June 1993.

Knouse, D., Ship Shock Trials, Lynchburg, VA, 9 August - 20 September 1993.

Matson, D., 64th Annual Scientific Meeting, Aerospace Medical Association, Toronto, Canada, 25-27 May 1993.

Matson, D., World Congress on Neural Networks, Portland, OR, 11-16 July 1993.

Matson, D., Technology 2003 Conference, Anaheim, CA, 7-9 December 1993.

Prell, A., ASMA Meeting, Toronto, Canada, 23-30 May 1993.

Prell, A., Introduction to Ventura Publishing course at OPM, Dallas, TX, 7-10 September 1993.

Rendin, R.W., Navy Occupational Health and Preventive Medicine Workshop, Norfolk, VA, 28 February - 4 March 1993.

Rendin, R.W., ASBREM Meeting at Wright-Patterson AFB, Dayton, OH 22-23 March 1993.

Rendin, R.W., Aerospace Medical Association's Annual Scientific Meeting, Toronto, Canada, 23-29 May 1993.

Rendin, R.W., TQL Senior Leader's Seminar, Norfolk, VA, 11-18 July 1993.

Rendin, R.W., Tri-Service Working Group on Spatial Orientation Situational Awareness, Pensacola, FL, 28-29 September 1993.

Rendin, R.W., Surgeon General's Conference MSC Leader's Conference, Bethesda, MD, 3-8 October 1993.

Rice, K., Total Force Manpower Management System Training, Pensacola, FL, 25-27 February 1993.

Rice, K.E., Combat Casualty Care Course, Field Exercise, San Antonio, TX, 31 March - 10 April 1993.

Rice, K., INAVLEAD Course, San Francisco, CA, 5-20 June 1993.

Rog, A., Course on a computer program at Hewlett Packard, HP Education Center, Detroit, MI, 24-30 January 1993.

Rog, A., Tri-Service Working Group Meeting on Impact, Pensacola, FL, 30 September 1993.

Schoenberg, L., NAVAIR Management Team Meeting, Washington, D.C., 2-4 March 1993.

Seemann, M.R., Head and Neck Symposium (SAE), Denver, CO, 8-10 December 1993.

Weiss, M.S., IEEE Committee Meetings, Washington, D.C., 11 January 1993.

Weiss, M.S., ASBREM Meeting at Wright-Patterson AFB, Dayton, OH 22-23 March 1993.

Weiss, M.S., Meeting of ISO/TC 108/SC4, London, England, 29 March - 2 April 1993.

Weiss, M.S., Institute of Electrical and Electronic Engineers HCEPC Meeting and ONR Visit, Washington, D.C., 13-14 June 1993.

Weiss, M.S., Fall '93 TARP Technical Working Group (TWG) for Biodynamics Meeting, NAS Pensacola, FL, 27-28 September 1993.

Weiss, M.S., Head and Neck Symposium (SAE), Denver, CO, 8-10 December 1993.

Willems, G., Head and Neck Symposium (SAE), Denver, CO, 8-10 December 1993.

Wilson, R., SAS Training Course, Austin, TX, 16-18 June 1993.

Wilson, R., SAS Training Course, Austin, TX, 7-9 July 1993.

Wilson, R., Articulated Total Body (ATB) Course at Wright-Patterson AFB, OH, 22-26 August 1993.

PRESENTATIONS FOR 1993

Anderson, R., Hart, R., Wahl, B., Hawkins, R., and Guccione, S., "Three-dimensional Modeling of the Head and Neck During Indirect Impact." Presented to the 1993 Annual Scientific Meeting of the Aerospace Medical Association, Toronto, Canada, 26 May 1993. Abstract Published in Aviation, Space and Environmental Medicine 64(5):444.

Anderson, T., "Relationship Between Added Head Mass and Cervical Strain Following $+G_z$ Impact Acceleration." Presented to the 1993 Annual Scientific Meeting of the Aerospace Medical Association, Toronto, Canada, 26 May 1993. Abstract Published in Aviation, Space and Environmental Medicine 64(5):444.

Gilbert, N., and Anderson, T., "Incidence of Cardiac Dysrhythmia in Human Research Volunteers Following Impact Acceleration." Presented to the 1993 Annual Scientific Meeting of the Aerospace Medical Association, Toronto, Canada, 24 May 1993. Abstract Published in Aviation, Space, and Environmental Medicine 64(5):420.

Grunsten, R., Prell, A., and Anderson, T., "Response of the Human Cervical Zone to $-G_x$ Impact Acceleration." Presented to the 1993 Annual Scientific Meeting of the Aerospace Medical Association, Toronto, Canada, 26 May 1993. Abstract published in Aviation, Space, and Environmental Medicine 64(5):444.

Guccione, S., "Uses of Mathematics in Biodynamical Research." Presented to the Mathematics Club, University of New Orleans, New Orleans, LA, 29 April 1993.

Holcombe, F.D., "Naval Biodynamics Laboratory Human Factors Research." Presented to the 1993 Fleet/Type Commanders Safety Officers Seminar, Naval Safety Center, Norfolk, VA, 8 March 1993.

Holcombe, F.D., "Effects of Ship Motion on Human Performance at Sea: Interim Report IV." Presented to the ABCD Working Group of Human Performance, Procurement Executive Ministry of Defence, Foxhill, Bath, United Kingdom, 26-28 April 1993.

Holcombe, F.D., "Cognitive Performance Test Battery Review." Presented to Battelle Corporation, Columbus, OH, 10-12 June 1993.

Holcombe, F.D., "First Total Quality Leadership Seminar." Presented at the Naval Biodynamics Laboratory Total Quality Training Seminar, New Orleans, LA, 25 June 1993.

Holcombe, F.D., "CANUKUS Human Performance at Sea Project Review." Presented to ABCD Working Group, Washington, D.C., 11-17 July 1993.

Holcombe, F.D., "A Day With Dr. Deming." Presented at the Naval Biodynamics Laboratory Total Quality Training Seminar, New Orleans, LA, 30 July 1993.

Holcombe, F.D., "NBDL Ship Motion Research: Solicitation for Human Research Volunteers." Presented to Naval Air Station, Pensacola, FL, 31 August-1 September 1993.

Holcombe, F.D., "Development and Validation of Procedures for Objective Assessment of Cognitive Performance." Presented to the NATO-ABCD Working Group on Human Performance at Sea, Soesterberg, The Netherlands, 8-10 November 1993.

Kaufman, B., "Total Quality Leadership." Presented to the Tulane University Biomedical Engineering Seminar Series, New Orleans, LA, 30 September 1993.

Kaufman, B., Rog, A., and Matson, D., "Developing Evaluation Criteria for Estimation of Short Latency Somatosensory Evoked Potentials." Presented to the 15th Annual International Conference of the IEEE Engineering in Medicine and Biology Society, San Diego, CA, 29 October 1993.

Matson, D., and Urbas, J., "An Artificial Neural Network for Detecting Abnormal Evoked Potentials During Impact Acceleration." Presented to the 1993 Annual Scientific Meeting of Aerospace Medical Association, Toronto, Canada, 26 May 1993. Abstract Published in Aviation, Space, and Environmental Medicine 64(5):462.

Matson, D., and Rog, A., "Technology Transfer Opportunities with the Naval Biodynamics Laboratory." Presented at the Technology 2003 Conference, Anaheim, CA, 7-9 December 1993.

Muzzy, W., and Anderson, T., "An Innovative Technique for Conducting a Site Survey of an Aircraft Accident." Presented to the 1993 Annual Scientific Meeting of Aerospace Medical Association, Toronto, Canada, 27 May 1993. Abstract Published in Aviation, Space, and Environmental Medicine 64(5):466.

Prell, A. and Anderson, T., "Photo Documentation of Impact Acceleration Experiments Involving Manikins and Human Research Volunteers." Presented to the 1993 Annual Scientific Meeting of Aerospace Medical Association, Toronto, Canada, 27 May 1993. Abstract Published in Aviation, Space, and Environmental Medicine 64(5):462.

Rog, A., "Overview of Lab Operations and Video Presentation." Presented to Saint Stanislaus School, Bay St. Louis, Mississippi, 18 May 1993.

Schoenberg, L.W., "Naval Biodynamics Laboratory Research Programs." Presented to the JTCG Munitions Effectiveness and Aircraft Survivability Crew Casualty Working Group, New Orleans,LA, 28 April 1993.

Weiss, M.S., "Subthrust Review: Navy Abrupt Acceleration Research." Presented to the Armed Services Biomedical Research Evaluation and Management (ASBREM) Committee Joint Technology Coordinating Group 5, Wright-Patterson Air Force Base, Dayton, OH, 22 March 1993.

Weiss, M.S., "Subthrust Review: Navy Vibration and Motion Research." Presented to the Armed Services Biomedical Research Evaluation and Management (ASBREM) Committee Joint Technology Coordinating Group 5, Wright-Patterson Air Force Base, Dayton, OH, 22 March 1993.

1993 PUBLICATIONS

Bibliography of Scientific Publications of the Naval Biodynamics Laboratory: 1980-1992. Naval Biodynamics Laboratory Report 93R001, July, 1993.

Matson, D., "*Chronic Motion Sickness Treated With Cognitive-Behavioral Training.*" CSERIAC Gateway, IV(2):16-17, 1993.

Kaufman, B., Rog, A., and Matson, D., "*Developing Evaluation Criteria for Estimation of Short Latency Somatosensory Evoked Potentials.*" Proceedings of the 25th Annual International Conference of the IEEE Engineering and Medicine and Biology Society, pp 440-441, 1993.

Mugnier, C., M-Squared Systems, Incorporated, "*Assessment and Evaluation of the Naval Biodynamics Laboratory X-Ray Anthropometry System.*" Report No. NBDL 93R006, Naval Biodynamics Laboratory, New Orleans, LA, December 1993.

Pittman, M., "*Evaluation of the Anthropometry System.*" Report No. NBDL 93R007, Naval Biodynamics Laboratory, New Orleans, LA, December 1993. (IN PRESS).

Pittman, M., Mugnier, C., GPA Associates, "*Photogrammetric Tasks for +Z Vertical Added Mass Experiments.*" Report No. NBDL 93R005, Naval Biodynamics Laboratory, New Orleans, LA, December 1993.

Pittman, M., Mugnier, C., GPA Associates, "*Manual of Close Range Photogrammetric Techniques for the Naval Biodynamics Laboratory.*" Report No. NBDL 93R008, Naval Biodynamics Laboratory, New Orleans, LA, December 1993.

Pittman, M., Mugnier, C., GPA Associates, "*Camera Network Design for Head Anthropometry and Initial Condition Determination.*" Report No. NBDL 93R009, Naval Biodynamics Laboratory, New Orleans, LA, December 1993.

Tijerina, L., and Browning, N., "*Measurements of Ship Motion Effects on Human Cognitive Performance at Sea.*" Report No. NBDL 93R003, Naval Biodynamics Laboratory, New Orleans, LA, August 1993.

Tijerina, L., and Lauber, E., "*A Taxonomic Approach to the Assessment of Ship Motion Effects on Human Cognitive Performance at Sea.*" Report No. NBDL 93R004, Naval Biodynamics Laboratory, New Orleans, LA, August 1993.

Tijerina, L., and Treaster, P., "*Exploring the Utility of Micro SAINT Models: Predictive Simulation With CIWS Load Operation Model Under Normal and MOPP/IV Conditions.*" Report No. NBDL 93R002, Naval Biodynamics Laboratory, New Orleans, LA, August 1993.

Willems, G.C., Knouse, D., "*A Simple Step Procedure Finds the Time Response of Filtered Data.*" EDN, pp 139-142, 9 December 1993.

DISTINGUISHED VISITORS IN 1993

NBDL hosted a CNO special interest tour in May 1993 of Foreign Naval Attaché from several NATO Countries.

OTHER DISTINGUISHED VISITORS IN 1993

CDR J. Adkinson	Naval Medical Clinic, New Orleans, LA
Mr. Terry Applebee	Naval Surface Warfare Center, Bethesda, MD
Mr. Xavier Avula	University of Missouri, Rolla, MO
Mr. Eric Baitis	Naval Surface Warfare Center, Bethesda, MD
Mr. Mark Bates	Coastal Systems Station, Panama City, FL
Ms. Jude Bazajou	University of New Orleans, New Orleans, LA
Mr. William Bles	Institute for Perception, TNO Soesterberg, The Netherlands
LCDR Jeff Blevins	Navy Foreign Liaison Office, Washington, D.C.
Mr. James Bost	NAVSEA 05D7, Washington, D.C.
Captain F. Briand	Commander, Naval Surface Reserve Force, New Orleans, LA

LCDR Donald Buchanan	Naval Support Activity, New Orleans, LA
Captain Richard L. Buck	Specialty Advisor to the Surgeon General For Preventive Medicine
Dr. Antonio B. Carvalhais	US Coast Guard R and D Center, Groton, CT
Dr. Paul Chirlian	University of New Orleans, New Orleans, LA
Mr. James L. Colwell	Defence Research Establishment Halifax, Canada
Ms. Karen Cox	Defense Financial and Accounting Service Charleston, SC
Mr. Mark Craig	NAVFACENG Command, Charleston, SC
Dean John Crisp	University of New Orleans, New Orleans, LA
Mr. Paul Crossland	Defence Research Agency Haslar, United Kingdom
Mr. Jeffrey Falzarano	University of New Orleans, New Orleans, LA
Mr. James Gagorik	Office of Naval Research, Washington, D.C.
Mr. Fred Guedry	Naval Aerospace Medical Research Laboratory Pensacola, FL
CDR Steven Hanson	4th Marine Air Wing, New Orleans, LA
Captain R SwN Peter Herlitz	Commander in Chief, Swedish Navy
LTCOL Roger Hesslebrock	Keesler AFB Hospital, Biloxi, MS
Ms. Maggie Horne	Defense Financial and Accounting Service Charleston, SC
Dr. David Hui	University of New Orleans, New Orleans, LA
Ms. Dawn Hussey	Defense Financial and Accounting Service Charleston, SC
Mr. Bahadir Inozu	University of New Orleans, New Orleans, LA
Mr. Jorge Izasa	Tulane University, New Orleans, LA
LT Michael Jackson	Bureau of Medicine, Washington, D.C.

Mr. Robert Jenkins	Naval Sea Systems Command, Washington, D.C.
Captain T. Jones	Naval Health Research Center, San Diego, CA
Dr. Jeff Keuhn	University of Oklahoma, Norman, OK
Mr. Will Lannes	University of New Orleans, New Orleans, LA
Dr. Myer Leonard	University of Minnesota, Bloomington, MN
Mr. Steven Linder	Office of Naval Research, Washington, D.C.
CPT R SwN Bjorn Olof Llunggren	Embassy of Sweden, Washington, D.C.
Dr. Arnold Mayer	Wright-Patterson AFB, Dayton, OH
Mr. Philip Mount	Coastal Systems Station, Panama City, FL
Dr. Robert Newburgh	Office of Naval Research, Washington, D.C.
Mr. Hans Christer Ornhagen	National Defence Research Establishment HÄrsfjärden, Sweden
Mr. Roland Palmer	Coastal Systems Station, Panama City, FL
Mr. Bill Patten	University of Oklahoma, Norman, OK
Mr. John H. Pattison	Naval Sea Systems Command, Washington, D.C.
Dr. Jim Ricciardi	Tulane University, New Orleans, LA
Mr. Dale Rome	Naval Surface Warfare Center, Bethesda, MD
CDR Angus Rupert	Naval Aerospace Medical Research, Pensacola, FL
Mr. Robert Schaffram	Naval Surface Warfare Center, Bethesda, MD
Mr. Hubert Schuler	NAVFACENG Command Charleston, SC
Dr. Avi Schupak	Israeli Navy
Mr. Pete Stevens	Coastal Systems Station, Panama City, FL
Mr. Bryan Stout	Coastal Systems Station, Panama City, FL
Dr. Jan Thunnissen	TNO Industrial Research Delft, The Netherlands

Dr. Louis Tijerina	Battelle Memorial Institute, Columbus, OH
Dr. Russ Trahan	University of New Orleans, New Orleans, LA
Dr. Tom Whitecloud	Tulane University, New Orleans, LA
Mr. Cornelis J.E. Wientjes	Institute for Perception TNO Soesterberg, The Netherlands
Captain Steve Wignall	Naval Medical Research Unit #2 Jakarta, Indonesia
Mr. Scott Willen	Ball Aerospace Huntington Beach, CA
LCDR Roxeane Young	Naval Reserve Personnel Center, Hennepin, CO

COMMUNITY SERVICE
PARTNERSHIP IN EDUCATION

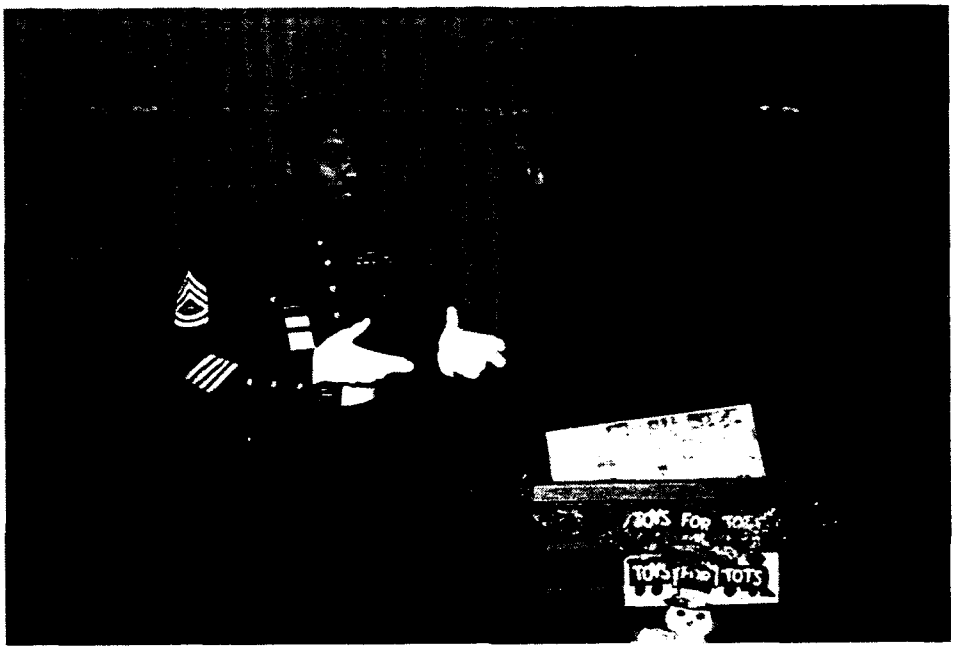
Since 1988 a partnership in education was formed between Henry C. Schaumburg School, an Orleans Parish elementary school and Naval Biodynamics Laboratory. Two-thirds of the Laboratory's military personnel participate in various endeavors including: weekly one-on-one tutoring of 15 students in reading, mathematics, science, and social studies which resulted in improved academic grades, standardized test scores and study skills, exterior painting of the school building, staffing special school events such as dances and the Spring Festival and arranging tours of visiting United States Navy Ships. Our sailors provide strong role models from varied cultural backgrounds and instill in the students a concern for their school, community, and nation.

For the Laboratory, the Partnership in Education Program has provided an avenue for its youngest staff members to gain personal insight and self esteem.

SR Connie Castrovinci, NBDL HRV, tutors a student at Schaumburg Elementary School

1993 TOYS FOR TOTS CAMPAIGN

The 1993 "Toys for Tots" campaign was a great success at NBDL. It doubled the previous year's contributions resulting in the most successful donation in the history of NBDL. Coordinating this successful campaign was SN Andrea L. Griffin. GySgt Pablo Martinez, representing the U.S. Marine Corps Reserve, graciously accepted NBDL's contributions to the needy children of the New Orleans area.



NBDL has participated and contributed to a variety of other community service programs, including:

Louisiana Special Olympics

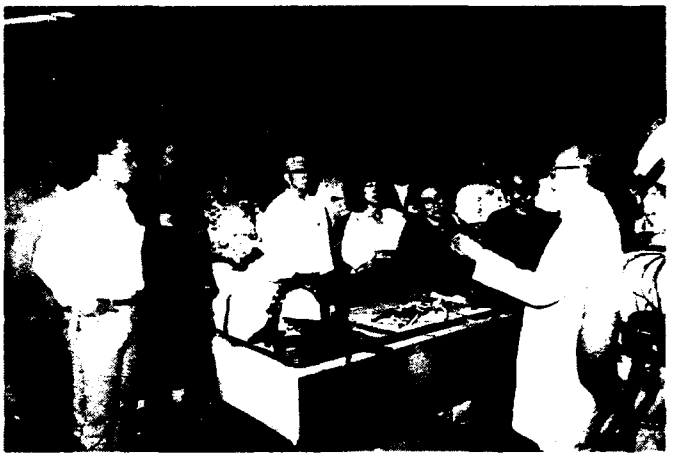
Navy and Marine Corps Relief Society

Combined Federal Campaign

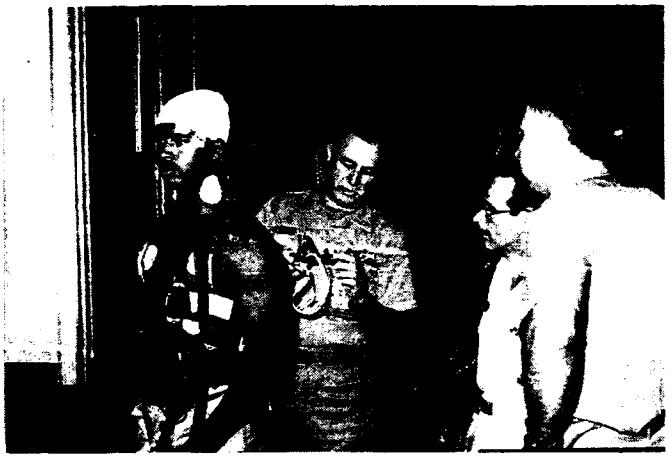
Blood Donations

Food Drive for the Needy

NBDL PERSONNEL IN ACTION



NBDL PERSONNEL IN ACTION



MILITARY AWARDS

SAILOR OF THE YEAR 1993

YN3 Curtis A. McDonald

SAILORS OF THE QUARTER 1993

AN R. Lopez Torres Jan - Mar 1993

HM3 George Taylor Apr - Jun 1993

SN Vincente Cammayo Jul - Sep 1993

SN Enrique Dedios Oct - Dec 1993

OTHER MILITARY AWARDS FOR 1993

Navy Achievement Medal
HM3 Kenneth Humphries
LT Sharon L. Conwell

Letters of Appreciation

SN Vincente Cammayo
DM3 Mario Hair
SN Steven McDaniel
AN Michael Meyer
FN Tristan Pineda
SN Mark Purtell
SN Richard Ramos
HM2 Gail Seaman

Letters of Commendation

PN3 Russel Loeve
FN Tristan Pineda
HM2 Gail Seaman
HM3 George Taylor

OUTSTANDING PERFORMANCE IN PHYSICAL READINESS PROGRAM

1993

SA Jorge Colon
FN Tina Eakin
SK2 Anthony George
SN Bruce Davis
SN Curtis McDonald
SA Adam Felder
AN Linton Strawder
YN3 Monica White
FN Daniel Demille
FN Scarlette Fisher
AN Grover Hill
LCDR Forrest Holcombe
CDR Robert Rendin
YNCS Stephen Rogan
SA Claudia Vargas

CIVILIAN AWARDS IN 1993

Civilians of the Quarter 1993

1993

Carol Pineiro	Jan-Mar 1993
June Gordon	Apr-Jun 1993
Jim Endler	Jul-Sep 1993
Carol Pineiro	Oct-Dec 1993

Letters of Commendation

Mr. James Endler
Ms. June Gordon
Ms. Carol Pineiro
Mr. Michael Suchanek

MILITARY PERSONNEL REPORTING/DEPARTING IN 1993

Military Reporting

SN Andrea Griffin
SN Monica White
SN Curtis McDonald
FN Tina Eakin
FN Scarlett Fisher
SR Cassie Gere
SN Candi Berger
SA Laura Eaton
FR Shekita Weaver
SR John Faulkner
FR Luz Leon-Hernandez
AN Frederick Shutters
FN Daniel Demille
SA Adam Felder
SA Claudia Vargas
SA Jorge Colon
SN Melissa McAllister
HM3 Kenneth Humphries
SK2 Clyde Prewitt

Military Departing

ABEAN Belson
SN Vincente Cammayo
LT Sharon Conwell
DM3 Mario Hair
OS3 Alan Hovis
PN3 Russel Loeve
AN Roberto Lopez
SN Stephen McDaniel
AA Michael Meyer
SN William Miller
FN Tristan Pineda
HM1 Harold Powe
SN Raymond Purtell
SA Richard Ramos
SA Darnell Smith
FN Donald Starling
AR Cassie Gere
AN Candi Berger
SN Frederick Shutters

CIVILIANS REPORTING/DEPARTING

Reporting

Ms. Marjorie Seemann
Mr. Dexter Walton

Departing

Dr. Norman "Sutt" Gilbert
Ms. Ann Gerads

IN MEMORY OF MICHAEL SUCHANEK

Michael Suchanek, an Electronics Technician in the Technology Department of NBDL, died of a heart attack on 14 February, 1993 at the age of 72. He served two tours of duty here, from December 1979 to march 1983 and April 1986 until his death. An extremely competent and multi-talented individual, he was truly an asset to this Laboratory. An enthusiastic workaholic, he was a definite self-starter, always anticipating job requirements and continually seeking ways to improve his technical talents via self-study and training seminars.

Although his duties were multi-faceted, he spent the majority of his time installing and maintaining the command's microcomputers and associated equipment, and demonstrated extraordinary ability in this area, as evidenced by the minimal amount of downtime experienced by the command's computer assets. His "can-do" attitude and enthusiasm to tackle any task, regardless of challenge, significantly contributed to the success of our research programs. At his memorial service his daughter stated that "Mike never met anything electrical or mechanical that he couldn't fix." A contributor to the end, Mike donated his body to science.

During his two tours of duty here, Mike received six superior performance cash awards and was nominated Civilian of the Quarter three times.

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TELEPHONE DIRECTORY

OFFICE OF THE COMMANDING OFFICER

CDR R. W. Rendin	Commanding Officer	257-3917
CDR L. W. Schoenberg	Executive Officer	257-3922
YNCS S. M. Rogan	Command Senior Chief	257-3921

RESEARCH DEPARTMENT

Marc Weiss, Ph.D.	Chief Scientist	257-3979
Salvadore Guccione, Ph.D.	Head, Math. Sciences Division	257-3975
LCDR F. D. Holcombe	Head, Human Factors Division	257-3947
Mr. Gary Jupiter	Head, Data Systems Division	257-3938

BIOMEDICAL SUPPORT DEPARTMENT

CDR T. G. Anderson	Department Head	257-3953

TECHNOLOGY DEPARTMENT

Mr. Gilbert Willems	Department Head	257-3892
Mr. Mark Lotz	Head, Bioinstrumentation Division	257-3900

RESEARCH SUPPORT DEPARTMENT

LT K. E. Rice	Administrative Officer, Head, Research Support Department	257-3920
SK2 C. Prewitt	Head, Admin. Supp. Div.	257-0030
SK2 C. Prewitt	Head, Supply Division	257-5478

FISCAL DEPARTMENT

Ms. Severina Garcia	Department Head	257-0030